(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 February 2001 (08.02.2001)

PCT

(10) International Publication Number
WO 01/08652 A1

(51) International Patent Classification[7]: A61K 7/48

(21) International Application Number: PCT/EP00/06597

(22) International Filing Date: 11 July 2000 (11.07.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
9918028.3 30 July 1999 (30.07.1999) GB

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*
— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/08652 A1

(54) Title: SKIN CARE COMPOSITION

(57) Abstract: A topical composition comprising: (a) conjugated linoleic acid and/or derivatives thereof; (b) a phenolic compound or mixtures thereof; and (c) a dermatologically acceptable vehicle; with the proviso that the phenolic compound is not a sunscreen. The product is particularly useful for treating wrinkles and soothing sensitive skin.

SKIN CARE COMPOSITION

FIELD OF THE INVENTION

This invention relates to topical compositions for application to human skin and to their use in improving the condition and appearance of skin.

BACKGROUND OF THE INVENTION

Skin is subject to deterioration through dermatological disorders, environmental abuse (wind, air conditioning, and central heating) or through the normal ageing process (chronoageing) which may be accelerated by exposure of skin to sun (photoageing). In recent years the demand for cosmetic compositions and cosmetic methods for improving the appearance and condition of skin has grown enormously.

Consumers are increasingly seeking anti-ageing cosmetic products that treat or delay the visible signs of chronoageing and photoageing skin such as wrinkles, lines, sagging, hyperpigmentation and age spots.

Consumers also frequently seek other benefits from cosmetic products in addition to anti-ageing. The concept of sensitive skin has also raised the consumer demand for cosmetic products that improve the appearance and condition of sensitive, dry and/or flaky skin and to soothe red, and/or irritated skin. Consumers also desire cosmetic products that have an oil/sebum control effect.

Many people are concerned with the degree of pigmentation of their skin. For example, people with age spots or freckles may wish such pigmented spots to be less pronounced. Others

may wish to reduce the skin darkening caused by exposure to sunlight or to lighten their natural skin colour. To meet this need many attempts have been made to develop products that reduce the pigment production in the melanocytes. However, the substances thus far identified tend to have undesirable side effects, e.g. skin irritation.

Consequently such substances are not suitable for cosmetic use or they can only be applied at a concentration at which their skin lightening effect is less than desired. Using a combination of different skin lightening substances may be considered to reduce adverse side effects but there is a substantial risk that by using such a combination the skin lightening is reduced as well due to competition effects. Therefore there is a need for improvement in the effectiveness of cosmetic skin lightening products particularly, such that they do not irritate the skin.

J07277939 describes a skin care composition for improving skin ageing and skin inflammation that contains (A) Flor de Manita and (B) at least 1 of active selected from oxygen removers, antioxidants, cell activators, anti-inflammatories, tyrosinase inhibitors and moisture-retaining agents. Amongst the many options of ingredients described for component B are quercetin, quercitolin, catechin, gallic acid, gamma-linolenic acid, and eicosapentaenoic acid.

J05271046 describes a skin lightening composition that contains an unsaturated fatty acid having 18 to 22 carbons and two or more unsaturated bonds, such as linoleic and arachidonic acid, and a polyphenol.

WO99/26588 describes anti-ageing skin care formulations comprising conjugated linoleic acid and which may optionally contain conventional sunscreens, such as benzophenones.

The art discussed above does not disclose the specific synergistic combination of conjugated linoleic acid with a phenolic compound (that is not a sunscreen) nor the use of such a specific combination for treating wrinkles, sensitive skin, dry skin, controlling oil/sebum secretion, or lightening skin. Phenolic compounds which act as a sunscreen are specifically excluded from the scope of the present invention.

A sunscreen is herein defined as an ingredient that provides a sun protection factor (SPF) of at least 2 when tested in a cosmetic product formulation on human skin using the standardised protocol described in the Food and Drug Administration Monograph Sunscreen Drug Products for Over-The-Counter Human Use; Final Monograph published in the Federal Register Volume 64, No 98, May 21 1999, pages 27666 to 27691.

We have now found that effective treatment and prevention of normal but cosmestically undesirable skin conditions due to chronoageing or photoageing, such as wrinkles, lines, sagging, hyperpigmentation and age spots, may be obtained through the application of cosmetic compositions to the skin which comprise conjugated linoleic acid and/or derivatives thereof in combination with a phenolic compound with the proviso that the phenolic compound is not a sunscreen. We have also found that the use of such cosmetic compositions advantageously provides further skin benefits in addition to anti-ageing such as soothing sensitive and/or irritated skin, controlling oil/sebum secretion and for lightening the skin.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a topical composition comprising:

(a) conjugated linoleic acid and/or derivatives thereof;
(b) a phenolic compound or mixtures thereof; and
(c) a dermatologically acceptable vehicle;

with the proviso that the phenolic compound is not a sunscreen.

According to a second aspect of the present invention there is provided a cosmetic method of providing at least one skin care benefit selected from: treating/preventing wrinkling, sagging, dry, aged and/or photodamaged skin; boosting collagen deposition in skin, boosting decorin production in skin, enhancing tissue repair; soothing irritated, red and/or sensitive skin; improving skin texture, smoothness and/or firmness; lightening skin; or controlling oil/sebum secretion, the method comprising applying to the skin a cosmetic composition as described above.

The present invention also encompasses the use of the inventive compositions for providing at least one skin care benefit selected from treating/preventing wrinkling, sagging, aged and/or photodamaged skin; boosting collagen deposition in skin, boosting decorin production in skin, enhancing tissue repair; soothing irritated, red and/or sensitive skin; improving skin texture, smoothness and/or firmness; lightening skin; and controlling oil/sebum secretion.

According to a still further aspect of the present invention there is provided the use of conjugated linoleic acid and/or derivatives thereof in combination with a phenolic compound or mixtures thereof, with the proviso that the phenolic compound is not a sunscreen, in a cosmetic topical composition for providing at least one cosmetic skin care benefit selected from treating/preventing wrinkling, sagging, aged and/or photodamaged skin; boosting collagen deposition in skin, boosting decorin production in skin, enhancing tissue repair; soothing irritated, red and/or sensitive skin; improving skin texture, smoothness and/or firmness; lightening skin; and controlling oil/sebum secretion.

The inventive compositions, methods and uses thus provide anti-ageing benefits which result in the promotion of smooth and supple skin with improved elasticity and a reduced or delayed appearance of wrinkles and aged skin, with improved skin colour. A general improvement in the appearance, texture and condition, in particular with respect to the radiance, clarity, and general youthful appearance of skin is achieved. The inventive compositions, methods and uses are also beneficial for soothing and calming sensitive and/or irritated skin, for lightening skin and for controlling oil/sebum secretion. Thus the present invention advantageously provides a wide range of skin care benefits.

The term treating as used herein includes within its scope reducing, delaying and/or preventing the above mentioned normal but cosmetically undesirable, skin conditions such as wrinkled, aged, and/or photodamaged, and/or irritated skin and generally enhancing the quality of skin and improving its appearance and texture by preventing or reducing irritation, wrinkling and increasing flexibility, firmness, smoothness, suppleness and elasticity of the skin. The compositions, methods and uses according to the invention

may be useful for improving skin which is already in a wrinkled, aged, photodamaged, irritated condition or for treating youthful skin to prevent or reduce those aforementioned undesirable changes due to the normal ageing/photo ageing process.

DETAILED DESCRIPTION OF THE INVENTION

Conjugated Linoleic Acid

Conjugated linoleic acid (hereinafter referred to as CLA) is a diunsaturated long chain (C18) fatty acid. CLA comprises a group of positional and geometric isomers of linoleic acid in which various configurations of cis and trans double bonds at positions (6, 8), (7, 9), (8, 10), (9, 11), (10, 12) or (11, 13) are possible. Thus twenty-four different isomers of CLA exist.

The invention also includes derivatives of the free acid which thus comprise conjugated linoleic acid moieties. Preferable derivatives include those derived from substitution of the carboxyl group of the acid, such as esters (e.g. triglyceride esters, monoglyceride esters, diglyceride esters, phosphoesters), amides (e.g. ceramide derivatives), salts (e.g. alkali metal and alkali earth metal salts, ammonium salts); and/or those derived from substitution of the C18 carbon chain, such as alpha hydroxy and/or beta hydroxy derivatives.

In the case of triglyceride ester derivatives, all positional isomers of CLA substituents on the glycerol backbone are included. The triglycerides must contain at least one CLA moiety. For example, of the three esterifiable positions on the glycerol backbone, the 1 and 2 positions may be esterified with CLA and by another lipid at position 3 or as an alternative, the glycerol backbone could

be esterified by CLA at the 1 and 3 positions with another lipid at position 2.

The most preferred isomers of CLA for use in the present invention are the cis 9 trans 11 (c9 t11) or trans 10 cis 12 (t10 c12) isomer. Preferably at least 1% by weight of the total CLA (and/or CLA moieties) present in the composition is in the form of the c9, t11 and/or t10, c12 isomer. More preferably at least 20% and most preferably at least 40%, by weight of the total CLA and/or CLA moieties present in the composition, is in the form of the c9, t11 isomer and/or t10, c12 isomer. In a particularly preferred embodiment the conjugated linoleic acid is enriched in the c9 t11 or the t10, c12 isomer. By enriched is meant that at least 50% by weight of the total CLA and/or CLA moieties present in the composition is in the form of the cis 9, trans 11 or the trans 10 cis 12 isomer - preferably, at least 70%, more preferably at least 80%, and most preferably at least 90% by weight of the total CLA and/or CLA moieties present in the composition, are in the form of the c9, t11 isomer or the t10 c12 isomer.

The CLA and/or derivatives thereof comprising CLA moieties according to the present invention are commercially available as oils that are rich in conjugated linoleic acid triglyceride such as Tung oil or as dehydrated castor oil (Unichema). A mix isomer product is available from Sigma and a c9 t11 isomer enriched CLA is available from Matreya inc. Alternatively CLA according to the preferred embodiments of the present invention may be prepared according to the method disclosed in WO 97/18320 whose contents are incorporated herein by reference. A preferred method of preparation is disclosed in Example 1 and 2 below.

Wherever the term conjugated linoleic acid or CLA is used in this specification it is to be understood that the

derivatives thereof comprising CLA moieties are also included. CLA moieties refers to CLA fatty acyl portion(s) of a CLA derivative.

The CLA, to be employed in accordance with the present invention is present in the topical composition in an effective amount. Normally the total amount of the active is present in an amount between 0.0001% and 50% by weight of the composition. More preferably the amount is from 0.01% to 10% and most preferably from 0.1% to 5% in order to maximise benefits at a minimum cost.

Phenolic Compounds

Phenolic compounds can be divided into at least 10 different classes depending on their basic chemical structure. The compounds include simple phenols (C_6), benzoquinones (C_6), phenolic acids (C_6-C_1), acetophenones (C_6-C_2), phenylacetic acids (C_6-C_2), hydroxycinnamic acids (C_6-C_3), phenylpropenes (C_6-C_3), coumarins, isocoumarins (C_6-C_3), chromones (C_6-C_3), naftoquinones (C_6-C_4), xanthones (C_6-C_1-C_6), stilbenes (C_6-C_2-C_6), flavonoids (C_6-C_3-C_6), lignans, neolignans $(C_6\text{-}C_3)_2$ and lignins $(C_6\text{-}C_3)_n$.

The term flavonoids represents a very large group of compounds consisting of two aromatic rings joined by a three carbon unit, e.g. C_6-C_3-C_6. The family of flavonoids includes isoflavonoids, monomeric flavonols, dihydroflavonoids, catechins, epicatechins (e.g. laurones), leucoanthocyanadins, proanthocyanadins, anthocyanadins, flavones, flavonones, chalcones, dihydrochalcones, isoflavones, neoflavones,

aurones, flavan 3 ols, flavan 3 ols, and anthrocyanins. The term isoflavanoids also includes isoflavones, pterocarpans, isoflavonones, rotenoids, isoflavans and isoflavanols.

The preferred phenolic compounds for use in the compositions of the present invention are flavonoids including flavonones such as naringenin, flavonols such as quercetin, catechin (e.g. epigallocatechingallate, EGCG), isoflavonoids such as daidzein, genistein, lycetin, and also phenolic acids, such as gallic acid, and the green tea polyphenols.

Quercetin, naringenin, daidzein, genistein, EGCG and green tea polyphenols may be obtained from Sigma. Plant extracts containing the phenolic compounds are also suitable for use in the present invention. For example, rutin, evening primrose, onion, citrus species contain quercetin and naringenin, soy contains daidzein and genistein and green tea varieties such as Camellia sinensis and assamica contain EGCG and green tea polyphenols.

Phenolic compounds that are specifically excluded from the present invention are those which are conventionally used as sunscreens such as para-amino benzoic acid and benzophenones.

The phenolic compound or mixtures thereof is employed in the inventive composition in an amount of from about 0.01% to about 10%, preferably in an amount of from about 10% to about 1%, most preferably in an amount of from about 0.1% to about 5%.

Dermatologically Acceptable Vehicle

The composition used according to the invention also comprises a dermatologically/cosmetically acceptable vehicle to act as a dilutant, dispersant or carrier for the actives. The vehicle may comprise materials commonly employed in skin

care products such as water, liquid or solid emollients, silicone oils, emulsifiers, solvents, humectants, thickeners, powders, propellants and the like.

The vehicle will usually form from 5% to 99.9%, preferably from 25% to 80% by weight of the composition, and can, in the absence of other cosmetic adjuncts, form the balance of the composition.

Optional Skin Benefit Materials and Cosmetic Adjuncts

Besides the actives, other specific skin-benefit actives such as sunscreens, skin lightening agents, skin tanning agents may also be included. The vehicle may also further include adjuncts such as antioxidants, perfumes, opacifiers, preservatives, colourants and buffers.

Product Preparation, Form, Use and Packaging

To prepare the topical composition used in the method of the present invention, the usual manner for preparing skin care products may be employed. The active components are generally incorporated in a dermatologically/cosmetically acceptable carrier in conventional manner. The active components can suitably first be dissolved or dispersed in a portion of the water or another solvent or liquid to be incorporated in the composition. The preferred compositions are oil-in-water or water-in-oil or water-in-oil-in-water emulsions.

The composition may be in the form of conventional skin-care products such as a cream, gel or lotion, capsules or the like. The composition can also be in the form of a so-called wash-off product e.g. a bath or shower gel, possibly containing a delivery system for the actives to promote adherence to the skin during rinsing. Most preferably the

product is a leave-on product; a product to be applied to the skin without a deliberate rinsing step soon after its application to the skin.

The composition may packaged in any suitable manner such as in a jar, a bottle, tube, roll-ball, or the like, in the conventional manner. It is also envisaged that the inventive compositions could be packaged as a kit of two separate compositions one containing the conjugated linoleic acid and the second containing the phenolic compound, to be applied to the skin simultaneously or consecutively.

The composition according to the present invention may also be formulated into a form suitable for oral ingestion such as a capsule, tablet or similar.

The method of the present invention may be carried out one or more times daily to the skin which requires treatment. The improvement in skin appearance will usually become visible after 3 to 6 months, depending on skin condition, the concentration of the active components used in the inventive method, the amount of composition used and the frequency with which it is applied. In general, a small quantity of the composition, for example from 0.1 to 5 ml is applied to the skin from a suitable container or applicator and spread over and/or rubbed into the skin using the hands or fingers or a suitable device. A rinsing step may optionally follow depending on whether the composition is formulated as a leave-on or a rinse-off product.

In order that the present invention may be more readily understood, the following examples are given, by way of illustration only.

EXAMPLES

Example 1

This example illustrates the synthesis of conjugated linoleic acid comprising the c9 t11 isomer and t10 c12 isomer.

Production of Mixed Isomers of CLA

`Analar Reagent' (AR) sodium hydroxide (0.6kg) was dissolved in 6kg of pharmaceutical grade propylene glycol by mixing and heating to 80-85°C. The sample was cooled and 2kg of safflower oil was added. Using standard pilot scale equipment the mixture was refluxed for 3 hours with fast stirring at 170°C. The reaction mix was cooled to about 95°C, the stirrer reduced to an intermediate speed, and the mix neutralised using 1.280 litre of 35.5% hydrochloric acid dissolved in demineralised water (8 litres), keeping the temperature at about 90°C. The reaction mix was allowed to settle and the aqueous phase was run off. The oil phase was washed with 2 x 1 litre of 5% AR salt solution and by 2 x 1 litre of demineralised water at 90°C, discarding any soapy material. The CLA enriched oil was dried at 100°C under vacuum before draining at about 50°C and filtered through a Buchner system containing a Whatman filter and a thin layer of celite-hyflo-filter aid. The mixed isomer CLA oil was stored under nitrogen at -25°C until required. The composition of the oil produced by this method is set out in table 1 below:

TABLE 1

Composition of mixed CLA fatty acids (wt%):	Relative Percentage of Total fatty acid lipid
c9,t11	34.1 **(47% of total CLA)**
t10,c12	34.1 **(47% of total CLA)**
c9,c11 & c10,c12	2.3
t9,t11t & t10,12t	0.7
Other CLA	1.4
Total CLA	**72.6**
16:0	7.0
16:1	0.8
18:0	2.5
18:1	13.3
18:2 (non-CLA)	3.3
Other fatty acid	0.5

2. Production of c9 t11 isomer enriched CLA

(I) Preparation of lauryl esters:

CLA prepared from Safflower (2.0kg) was added to 2 x molar equivalents of lauryl alcohol (1-dodecanol; 98% ex Aldrich chemicals) along with 5.96kg of demineralised water. The temperature was adjusted to 25°C and 1% (w/w) of *Geotrichum Candidum* (ex Amano Pharmaceuticals, Japan) was added premixed with a little water, and mixed vigorously. The reaction was stopped at 44 hours. The vessel was heated to 80-90°C, the aqueous layer drained and the oil was washed with demineralised water and dried at 100°C under vacuum for 30 minutes. The oil was cooled to 50°C and filtered through a Buchner system containing a Whatman filter and a thin layer of celite-hyflo-filter aid.

(II) Separation of the enriched c9,t11 CLA esters:

Residual lauryl alcohol was removed at 130°C at 25-35ml per minute by molecular distillation. The residue was coarsely separated into the lauryl esters (enriched in c9,t11 CLA) and free acids (enriched in t10,c12 CLA) by evaporation at 158°C at a flow rate of 25-35ml per minute. Any remaining free acids in the lauryl ester residue was reduced by a further distillation at 171°C at a flow rate of 30-40ml per minute. 2790g of lauryl ester residue was neutralised at 90°C using 330ml of 4M AR sodium hydroxide, followed by separation of the oil from the aqueous phase, 3x washes of the oil in demineralised hot water, a further 0.1M alkali wash and two hot water washes. The enriched lauryl ester oil sample was dried as before.

(III) Saponification of the enriched c9,t11 CLA lauryl esters:

Lauryl esters of c9,t11 enriched CLA were saponified using AR sodium hydroxide/96% food grade ethanol and re-acidified using AR concentrated hydrochloric acid. The reaction mix containing the enriched CLA free fatty acids was dried at 100°C and filtered as before at about 50°C. Lauryl alcohol was evaporated off at 132°C at 25-30ml per minute. In order to remove any residual lauryl alcohol, free alcohols were esterified to the fatty acids present in the reaction mix, using SP392 *Mucor miehei* lipase (5%, batch lux 0110 ex Novo Nordisk). The enriched C9 t11 CLA containing fatty acids were separated from the lauryl esters using molecular distillation under vacuum at 155°C at 15-20ml per minute.

The composition of the enriched C9 t11 CLA produced by the above method is set out in table 2 below:

TABLE 2

Composition of typical preparation of enriched c9,t11 CLA fatty acids (wt%):	Relative Percentage of Total Fatty Acid Lipid
c9,t11	66.1 **(93% of total CLA)**
t10,c12	4.1
c9,c11 & c10,c12	0.3
t9,t11t & t10,12t	0.4
Other CLA	0.2
Total CLA	**71.1**
16:0	1.6
16:1	-
18:0	0.4
18:1	22.3
18:2 (non-CLA)	4.5
Other fatty acid	0.1

(II) Separation of the enriched t10,c12 CLA:

Residual lauryl alcohol was removed at 130°C at 25-35ml per minute by molecular distillation. The residue was coarsely separated into the lauryl esters (enriched in c9,t11 CLA) and free acids (enriched in t10,c12 CLA) by evaporation at 158°C at a flow rate of 25-35ml per minute.

Isolation of the enriched t10,c12 CLA

The CLA free acids from step (II) above were distilled again at 160-165'C and 20-30 ml/min to reduce the ester content. Residual lauryl alcohol was reduced further by a distillation at 131°C and 25-30 ml/min flow rate. In order to remove any residual lauryl alcohol, free alcohols were

esterified to the fatty acids present in the reaction mix, using SP392 *Mucor miehei* lipase (5%, batch lux 0110 ex Novo Nordisk). The enriched t10,c12 CLA containing fatty acids were separated from the lauryl esters using molecular distillation under vacuum at 155°C at 15-20ml per minute. The composition of the enriched t10,c12 CLA generated by this method is set out in table 3 below:

TABLE 3

Composition of typical preparation of enriched t10.c12 CLA fatty acids (wt%):	**B**
c9,t11	8.3
t10,c12	53.9 **(80.5% of total CLA)**
c9,c11 & c10,c12	2.9
t9,t11t & t10,12t	1.1
Other CLA	0.7
Total CLA	**66.9**
16:0	13.6
16:1	-
18:0	4.6
18:1	10.3
18:2 (non-CLA)	3.1
Other fatty acid	1.5

Example 2 - Preparation of t10, c12 CLA triglycerides

Enriched t10, c12 CLA (10g) prepared according to example 1 was mixed with 1.01g (10.1%) of glycerol (Pricerine 9083 glycerine CP from Ellis and Everards) and 0.5g (approximately 5%) of SP392 *Mucor Meihie* non-specific lipase (Mucor Meihie Ex Novo Nordisk Batch Lux 0110) was added. The mixed materials were stirred under vacuum in a rotary-evaporator at 60°C with a slight nitrogen bleed.

After 96 hours the reaction was stopped by filtering the mixture through a thin layer of celite super-cel filter aid on a buchner filter collecting the CLA triglyceride oil phase, the composition of which is set out in table 4 below:

TABLE 4

Fatty Acid composition of the triglycerides	Relative Percentage of Total fatty acid Lipid
c9,t11	8.3
t10,c12	54.8 **(81.7% of total CLA)**
c9,c11 & c10,c12	2.7
t9,t11t & t10,12t	1.3
Other CLA	0
Total CLA	**67.1**
16:0	13.5
16:1	0.1
18:0	4.9
18:1	10.3
18:2 (non-CLA)	3.4
Other fatty acid	0.7

Example 3

Procedure for Measuring Procollagen-I and Decorin Synthesis in Human Dermal Fibroblasts

Preparation of Dermal Fibroblast Conditioned Medium

Primary human foreskin fibroblasts at passage 2 (P2) were seeded into 12-well plates at 10000 cells/cm^2 and maintained for 24 hours in an atmosphere of 5% carbon dioxide and 4% oxygen in Dulbeccos Modified Eagles Medium (DMEM) supplemented with 10% foetal calf serum. After this time the cells were washed with serum free DMEM and then incubated in fresh serum free DMEM for a further 60 hours.

The fibroblast monolayers were then washed again with serum free DMEM. Test reagents and vehicle controls were added to the cells in triplicate in a final volume of 0.4ml/well fresh serum free DMEM and incubated for a further 24 hours. This fibroblast conditioned medium was either analysed immediately or snap frozen in liquid nitrogen and stored at -70°C for future analysis. The cells were then counted and data from the dot-blot analysis subsequently standardised to cell number.

Example 4

Dot Blot Assay for Procollagen-I and Decorin Protein in Dermal Fibroblast Conditioned Medium

Samples of conditioned medium from dermal fibroblasts treated with vehicle (as a control) or test reagents were supplemented with 20mM dithiothreitol (1:10 dilution of 200mM stock solution) and 0.1% sodium dodecylsulphate (1:100 dilution of 10% stock solution), mixed well and then incubated at 75°C for 2 minutes. A standard for the assay was generated by serial dilution of neat fibroblast conditioned medium from fibroblasts seeded at 10000 cells/cm^2 in a 175cm^2 flask and maintained in serum free DMEM as described above.

Assay samples were subsequently applied in triplicate to a prewetted sheet of Immobilon-P transfer membrane using the 96-well Bio-Dot Apparatus from Bio-Rad as described in the manufacturers guidelines. Approximately 200µl of medium was applied per well. The medium was allowed to filter through the membrane under gravity (30 minutes) after which the membrane was washed twice with PBS (200µl). These PBS washes were allowed to filter through the membrane under gravity (2x15 minutes). The Bio-Dot apparatus was then

attached to a vacuum manifold and a third and final PBS wash carried out under suction. The apparatus was disassembled, the membrane removed and quickly cut as required before being placed in blocking buffer overnight at 4°C.

Membranes prepared for decorin analysis were blocked with 3% (w/v) BSA/ 0.1% (v/v) Tween 20 in PBS, whilst those for procollagen-I analysis were blocked with 5% (w/v) non fat dried milk powder/0.05% Tween 20 in PBS. The following day, the membranes were probed with 1:10000 dilution of primary antibodies to either human procollagen-I (MAB1912; rat monoclonal; Chemicon Int. Inc., Temecula, CA) or human decorin (rabbit polyclonal; Biogenesis) for 2 hours at room temperature. The membranes were subsequently washed with TBS/0.05% Tween 20 (3 x 5 minutes) and then incubated with 1:1000 dilution of ^{125}I-conjugated anti-rat or anti-rabbit F(ab')2 fragments (Amersham) as required for 1 hour at room temperature. Following this the Immobilon strips were again washed with TBS/Tween 20 (3 x 5 minutes) before being allowed to dry in air at room temperature. The dried membranes were wrapped in cellophane and exposed to a Molecular Dynamics storage phosphor screen for 16-18 hours. At the end of this time the exposed screen was scanned by a phosphorimager (Molecular Dynamics Phosphorimager SF) using ImageQuant™ software. Dot intensity was assessed by computer-assisted image analysis using the quantification tools in ImageQuant™, standardised to cell number and the effects of various test reagents on decorin and procollagen-I synthesis were determined relative to a vehicle treated control value of 100 arbitrary units.

Example 5

TESTS

The table 5 below indicates the synergistic effect of conjugated linoleic acid in combination with the phenolic compound epigallocatechin gallate (EGCG) on procollagen-I and/or decorin synthesis in human dermal fibroblasts, and the amounts in which the actives were applied. In order to normalise the results the effects of the test substances were determined relative to a vehicle treated control value of 100 arbitrary units. The concentrations of reagents used in the trials had no influence on cell viability.

TABLE 5

Treatment	Procollagen-I	Decorin
Control (Vehicle)	100	100
0.1 µM CLA		68.29%
0.5 µg/ml EGCG		99.6%
0.1 µM CLA 0.5 µg/ml EGCG		157.11%

The results in table 5 indicate that the combination of conjugated linoleic acid with a phenolic compound synergistically upregulates the synthesis of procollagen-I and/or decorin in human dermal fibroblasts.
The level of decorin in skin is associated with improved condition and appearance of skin. Increasing the level of decorin in skin is important for controlled and correct deposition of collagen in skin which is associated with many skin benefits such as wrinkle effacement and dermal repair of photodamaged skin.

Example 6

This example demonstrates the synergistic effect of the specific combination of conjugated linoleic acid with a phenolic compound on reducing the inflammatory response of dermal fibroblasts.

Fibroblasts PGE_2 and ICAM Assay

Intracellular adhesion molecules (ICAM) and PEG_2 production by human skin fibroblasts can be induced by the inflammatory stimulus PMA (phorbal myristate acetate). PMA represents an external stressor which induces oxidative stress and inflammatory responses in cells. This model is used to model inflammation *in vivo*.

Primary human foreskin fibroblasts at passage 2 (P2) were seeded into 96-well plates at 10000 cells/well and maintained for 24 hours in an atmosphere of 5% carbon dioxide in Dulbeccos Modified Eagles Medium (DMEM) supplemented with 10% foetal calf serum. The test substances as indicated in the table 7 below were added to fresh cell media (DMEM, supplemented with 10% foetal calf serum) in dimethylsulphoxide and ethanol final concentration <1%) in triplicate and incubated for a further 24 hours. Phorbal myristate acetate (PMA) (Sigma) was added 10 nM to the media and the cells incubated for a further 24 hours. The control only contained the vehicle did not contain any test compounds or any PMA. The fibroblasts/media were then analysed as described below immediately or snap frozen in liquid nitrogen and stored at -70°C for future analysis. The cells were then counted and data from the dot-blot analysis subsequently standardised to cell number.

Prostaglandin E2 (PGE_2) assay:

Volumes of 50µl culture medium were taken for PGE_2 assay after gently shaking the culture plate. PGE_2 levels in the medium were determined with a Biotrak PGE_2 immunoassay kit (Amersham, UK). The assay is based on the competition between unlabelled PGE_2 in the sample and a fixed quantity of horseradish peroxidase labelled PGE_2 for a limited amount of fixed PGE_2 specific antibody. Concentrations of unlabelled sample PGE_2 are determined according to a standard curve which was obtained at the same time.

ICAM-1 assay:

Media were discarded and cells washed with Dulbecco PBS. To the washed cells, 150 µl 0.1% Triton X-100 (Sigma) was added for 3 minutes to extract ICAM from cell membrane. The extracts were transferred to Eppendoff centrifuge tubes and centrifuged at 1000 g for 2 min to remove cell debris. A volume of 100 µl supernatant was used for ICAM assay. The soluble ICAM-1 was assessed with commercially available immunoenzymometric assay kit (R&D Systems). Concentrations of ICAM-1 in the samples were determined based on parallel running standard curve.

The results that were obtained from the PGE_2 and ICAM assay are summarised in table 6 below.

TABLE 6

Treatment	% of Inhibition Of Fibroblast PGE_2 Levels	% of inhibition of fibroblast ICAM production
Control	100	100
PMA treated	0	0
PMA +CLA 0.1 μM	16.9	
PMA + EGCG 5μM	35.6	
PMA +CLA 0.1 μM+ EGCG 5μM	59.4	
PMA + CLA 1 μM		27.7
PMA + EGCG 5μM		4.5
PMA +CLA 1 μM+ EGCG 5μM		93.1
PMA + CLA 5μM	14.5	
PMA + genistein 5μM	52	
PMA + CLA 5μM + genistein 5μM	85.7	

The above results show that challenging cells with an inflammatory stimulus such as PMA (Phorbol myristyl acetate) causes an increase in the inflammatory response as measured by prostaglandin E2 (PGE_2) production. The specific combination of conjugated linoleic acid with phenolic compound synergistically reduces the inflammatory response as measured by PGE_2 production. The results thus demonstrate that the specific combinations of actives within the scope of the present invention exhibit surprisingly synergistic anti-inflammatory activity.

The above results also demonstrate that challenging cells with PMA causes an increase in ICAM production. Treating the cells with a combination of conjugated linoleic acid with phenolic compound synergistically decreases the production of Intracellular adhesion molecule (ICAM), which is another marker of inflammation. These results thus further

demonstrate that the specific combinations of actives within the scope of the present invention exhibit a good and surprisingly synergistic anti-inflammatory activity.

Example 7

The formulation below describes an oil in water cream suitable for the methods and uses according to the present invention. The percentages indicated are by weight of the composition.

	Wt%	Wt%	Wt%
Mineral Oil	4	4	4
Conjugated linoleic acid (triglyceride) ex Loders Croklaan	1.15	2	3
Green tea polyphenols	0	2	0
EFCG	0	0	1
Quercetin	0.5	0	0
Brij 56*	4	4	4
Alfol 16RD*	4	4	4
Triethanolamine	0.75	0.75	0.75
Butane-1,3-diol	3	3	3
Xanthan gum	0.3	0.3	0.3
Perfume	qs	qs	qs
Butylated hydroxy toluene	0.01	0.01	0.01
Water	To 100	to 100	to 100

*Brij 56 is cetyl alcohol POE (10)
Alfol 16RD is cetyl alcohol

Example 8

The formulation below describes an emulsion cream according to the present invention.

FULL CHEMICAL NAME OR CTFA NAME	TRADE NAME	WT.%	WT.%	WT %
CLA triglyceride 93%, C9,t11 isome by weight of total CLA moieties made according to Example 1 Croklaan		2.0	3	1.5
Gallic acid		1	0	0
Genistein		0	2	
Diadzein		0	0	1.5
Disodium EDTA	Sequesterene Na2	0.05	0.05	0.05
Magnesium aluminium silicate	Veegum Ultra	0.6	0.6	0.6
Methyl paraben	Methyl Paraben	0.15	0.15	0.15
Simethicone	DC Antifoam Emulsion	0.01	0.01	0.01
Butylene glycol 1,3	Butylene Glycol 1,3	3.0	3.0	3.0
Hydroxyethylcellulose	Natrosol 250HHR	0.5	0.5	0.5
Glycerine, USP	Glycerine USP	2.0	2.0	2.0
Xanthan gum	Keltrol 1000	0.2	0.2	0.2
Triethanolamine	Triethanolamine (99%)	1.2	1.2	1.2
Stearic acid	Pristerene 4911	3.0	3.0	3.0
Propyl paraben NF	Propylparaben NF	0.1	0.1	0.1
Glyceryl hydrostearate	Naturechem GMHS	1.5	1.5	1.5
Stearyl alcohol	Lanette 18 DEO	1.5	1.5	1.5
Isostearyl palmitate	Protachem ISP	6.0	6.0	6.0
C12-15 alcohols octanoate	Hetester FAO	3.0	3.0	3.0
Dimethicone	Silicone Fluid 200 (50cts)	1.0	1.0	1.0
Cholesterol NF	Cholesterol NF	0.5	0.5	0.5
Sorbitan stearate	Sorbitan Stearate	1.0	1.0	1.0
Butylated hydroxytoluene	Embanox BHT	0.05	0.05	0.05
Tocopheryl acetate	Vitamin E Acetate	0.1	0.1	0.1
PEG-100 stearate	Myrj 59	2.0	2.0	2.0
Sodium stearoyl lactylate	Pationic SSL	0.5	0.5	0.5
Hydroxycaprylic acid	Hydroxycaprylic Acid	0.1	0.1	0.1
Alpha-bisabolol	Alpha-bisabolol	0.2	0.2	0.2
Water, DI		q.s. to 100	q.s. to 100	q.s. to 100

Both the above topical compositions of example 7 and 8 provide an effective cosmetic treatment to improve the appearance of wrinkled, aged, photodamaged, and/or irritated skin, when applied to normal skin that has deteriorated through the aging or photoageing or when applied to youthful skin to help prevent or delay such deteriorative changes. The compositions are also effective for soothing irritated skin, conditioning dry skin, lightening skin colour and reducing oil and sebum secretions. The compositions can be processed in conventional manner.

CLAIMS

1. A topical composition comprising:

   (a) conjugated linoleic acid and/or derivatives thereof;
   (b) a phenolic compound or mixtures thereof;
   (c) a dermatologically acceptable vehicle;

   with the proviso that the phenolic compound is not a sunscreen.

2. A topical composition according claim 1 wherein at least 1% by weight of the conjugated linoleic moieties of the acid and/or derivatives thereof are present as the cis 9, trans 11 isomer and/or the trans 10 cis 12 isomer.

3. A topical composition according claim 2 wherein at least 50%, and preferably at least 90% by weight of the conjugated linoleic moieties of the acid and/or derivatives thereof are present as the cis 9, trans 11 isomer and/or the trans 10 cis 12 isomer.

4. A topical composition according to any of the preceding claims wherein the phenolic compound is chosen from simple phenols (C_6), benzoquinones (C_6), phenolic acids (C_6-C_1), acetophenones (C_6-C_2), phenylacetic acids (C_6-C_2), hydroxycinnamic acids (C_6-C_3), phenylpropenes (C_6-C_3), coumarins, isocoumarins (C_6-C_3), chromones (C_6-C_3),

naftoquinones (C_6-C_4), xanthones (C_6-C_1-C_6), stilbenes (C_6-C_2-C_6), flavonoids (C_6-C_3-C_6), lignans, neolignans $(C_6$-$C_3)_2$ and lignins $(C_6$-$C_3)_n$.

5. A topical composition according to any of the preceding claims wherein the phenolic compound is selected from the group comprising phenolic acids, flavonoids, isoflavonoids, or derivatives thereof or mixtures thereof.

6. A topical composition according to claim 5 wherein the phenolic compound is epigallocatechin gallate, naringenin, quercitin, catechin, daidzein, genistein, lycetin, gallic acid, or a green tea phenol.

7. A topical composition according to any of the preceding claims wherein the phenolic compound is present at a level of 0.01 to 10% by weight of the composition.

8. A topical composition according to any of the preceding claims wherein the composition is a leave on composition.

9. A cosmetic method of providing at least one cosmetic skin care benefit selected from: treating/preventing wrinkling, sagging, dry, aged and/or photodamaged skin; boosting/maintaining collagen levels in skin, boosting/ maintaining decorin levels in skin, enhancing tissue repair; soothing irritated, red and/or sensitive skin; improving skin texture, smoothness and/or firmness; lightening skin; controlling oil/sebum secretion; the

method comprising applying to the skin a topical composition as claimed in any preceding claim.

10. Use of a cosmetic composition as claimed in any of claims 1 to 8 for providing at least one cosmetic skin care benefit selected from treating/preventing wrinkling, sagging, aged, dry, and/or photodamaged skin; boosting/maintaining collagen levels in skin, boosting/maintaining decorin levels skin, enhancing tissue repair; soothing irritated, red and/or sensitive skin; improving skin texture, smoothness and/or firmness; and lightening skin; controlling oil/sebum secretion.

11. Use of conjugated linoleic acid and/or derivatives thereof in combination with a phenolic compound or mixtures thereof in a cosmetic topical composition for providing at least one cosmetic skin care benefit selected from treating/preventing wrinkling, sagging, aged and/or photodamaged skin; boosting/maintaining collagen levels in skin, boosting/maintaining decorin levels in skin, enhancing tissue repair; soothing irritated, red and/or sensitive skin; improving skin texture, smoothness and/or firmness; lightening skin; controlling oil/sebum secretion; with the proviso that the phenolic compound is not a sunscreen.

INTERNATIONAL SEARCH REPORT

Interr ıal Application No
PCT/EP 00/06597

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61K7/48

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE CHEMABS 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; 120:116508, EGAWA MAKOTO ET AL.: XP002153396 abstract & JP 05 271046 A (LION CORP) 19 October 1993 (1993-10-19) ---	1,4,6-11
X	FR 2 694 692 A (THOREL JEAN NOEL) 18 February 1994 (1994-02-18) page 2, line 18 - line 24 claims 1,4,5 --- -/--	1,4,5, 8-11

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents:

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search	Date of mailing of the international search report
22 November 2000	08/12/2000

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INTERNATIONAL SEARCH REPORT

Interr nal Application No
PCT/EP 00/06597

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
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